Analysis of Modification Types in Navy Construction Contracts

BY

WILLIAM J. PROUT

A REPORT TO THE GRADUATE COMMITTEE OF THE DEPARTMENT OF CIVIL ENGINEERING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ENGINEERING

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Dedication:

To my wife and kids: Sue, Amanda, and Corey:
Thanks for putting up with my countless hours sitting in front of the computer, while I listened to my head-banging music, attempted to sing, and frequently cursed the lifeless computer monitor.

Acknowledgements:

Thanks to the following Southern Division associates for their valuable assistance and advice: Chip Bailey, Al Corbin, Larry Mellichamp, Bobbie Rittal, and Liz Story.

Great thanks to my Committee Chairman, Dr. Charles Glagola, for his time and guidance.

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1. Abstract

Modifications, or change orders, in Navy construction contracts are a seemingly inevitable fact of life. In this report I analyzed nearly 8400 modifications in over 2200 completed Navy construction contracts from Southern Division of the Naval Facilities Engineering Command to identify the most frequent and expensive categories.

Using the modification reason code, the modifications were divided into 20 categories and the effect of each of these categories was determined quantitatively. The data, which I found was not normally distributed, was run three ways:

1) Unadjusted
2) Adjusted for planned or expected modifications
3) Adjusted for planned or expected modifications and terminated contracts

The third way is the most representative of a "typical" contract and the modifications with the largest effect on contract price are:

1) Unforeseen Conditions, 2.65% increase over the total of all contract prices
2) Design Changes, 1.82% increase
3) Customer Requested Changes, 1.64% increase

Overall, modifications increased the average contract price by 7.78%, justifying the customary practice of including a 10% contingency in funding estimates.

I also report on several problems in the use of modification reason codes that effect the analysis, though not significantly.

2. Scope of Study

Contract modification data from Navy construction contracts within Southern Division (SOUTHDIV) of Naval Facilities Engineering Command (NAVFAC) were manipulated and sorted using the modification reason codes to determine the average number and average costs of the various types of modifications to a contract. The data used was imported from the Facilities Information System (FIS) database.

Since contract information and contract events that occurred prior to the start of FIS in the late 80's were never inputted into the FIS system, only contracts with complete data were examined.

Only 100% complete construction contracts with no claims or other action pending were used. The data contained many contracts (24%) with no modifications.

Not included in the data are "no cost" modifications which do not change the contract price. These include:

a) Strictly administrative modifications, which would, for example, change the address of the paying activity.

b) Even swap modifications where two or more changes having equal additive and deductive values are combined into a single modification, yielding a zero net change in contract price.

Finally, all dollar amounts are rounded to the nearest dollar.

3. Classification of Modification Types

3.2 Introduction

A four-letter modification reason code is assigned to every modification. These codes are defined in the FIS Training Manual as follows:

ADMN	Administrative
CANC	Canceling Modification
CLMA	Appeal of Contracting Officer's Decision
CLMD	Claim Forwarded to NAVFAC for Resolution
CLMP	Pending Claim
CLMR	Final Decision Rendered and Claim Upheld
COND	Construction Deficiency
CONV	Termination for Convenience
CRCY	Currency Revaluation
CREQ	Customer Request
CRIT	Overall Criteria Change
DEFG	Definitizing Modification
DFLT	Contractor Defaults
DSGC	Design Omission
DSGD	Design Error
DSGN	Design Deficiency
EROM	Error or Omission
ESHL	Environment, Safety, and Health
GMDL	Government Caused Delay
HQDR	Headquarters Directed
IDEA	Idea
IDSN	Interior Design
INIT	Initiate Continuation
INSP	Title II
LIQD	Liquidated Damages
OPMM	Operations and Maintenance Manual
OPTN	Option
OPTP	Option Period
PCAS	Post Construction Award
PLAN	Planned
RDSN	Redesign
RSUB*	Resubmittal Costs
SCON	Special Consultation
SCPE	Scope
SITE	Resiting
STAT	Statutory Regulations

TIME	Time Delay
UNFO	Unforeseen Conditions
UNIL*	Unilateral Modification
VALD	Value Engineering Design
VALE	Value Engineering
VALU	Value Engineering Construction

* These two modification types were not defined in the FIS Training Manual, but listed in a 1987 SOUTHDIV Memo included as Appendix A. They only show up a total of three times in the FIS data.

3.3 Categories

Since some of the reason codes are used very infrequently in the data (less than five times) or are related to one or more others, for the purpose of analysis they were grouped together in 20 modification categories as shown in Table 1 on the following page. These reason codes do not appear in the data: CRCY, IDSN, INIT, and OPMM.

Table 1: Modification Categories

	Category	Reason Code	Frequency in data	Description
1	Claim	CLMA	3	Appeal of Contracting Officer's Decision
		CLMD	3	Claim Forwarded to NAVFAC for Resolution
		CLMP	8	Pending Claim
		CLMR	41	Final Decision Rendered and Claim Upheld
			55	
2	Design	DSGC	75	Design Omission
		DSGD	85	Design Error
		DSGN	2154	Design Deficiency
			2314	
3	Other	CANC	2	Canceling Modification
		ESHL	2	Environment, Safety, and Health
		HQDR	4	Headquarters Directed
		IDEA	1	Idea
		INSP	1	Title II
		PCAS	2	Post Construction Award
		RSUB	1	Resubmittal Costs
		SCON	3	Special Consultation
		SITE	1	Resiting
		UNIL	2	Unilateral Modification
		OPTN	6	Option
		OPTP	1	Option Period
			26	
4	VE	VALD	4	Value Engineering Design
		VALE	30	Value Engineering
		VALU	2	Value Engineering Construction
			36	
5	ADMN	ADMN	125	Administrative
6	COND	COND	20	Construction Deficiency
7	CONV	CONV	6	Termination for Convenience
8	CREQ	CREQ	1790	Customer Request
9	CRIT	CRIT	228	Overall Criteria Change
10	DEFG	DEFG	265	Definitizing Modification
11	DFLT	DFLT	11	Contractor Defaults
12	EROM	EROM	114	Error or Omission
13	GMDL	GMDL	45	Government Caused Delay
14	LIQD	LIQD	132	Liquidated Damages
15	PLAN	PLAN	68	Planned
16	RDSN	RDSN	10	Redesign
17	SCPE	SCPE	162	Scope
18	STAT	STAT	8	Statutory Regulations
19	TIME	TIME	25	Time Delay
20	UNFO	UNFO	2926	Unforeseen Conditions
			8366	Total number of modifications

4. Data Collection and Analysis

4.1 Initial Processing

The data exported from FIS was received as a text file containing about 22,496 lines of data. Table 2 below shows a sample of the original data prior to importing into an Excel spreadsheet.

Table 2: Original Data Sample

Contract #, P0000#		Date entered	Contract type	Description	Location	Amount	Fraction complete
94C0976		8/15/95	CON	INSTALL SULFER DIOXIDE GAS DEC	BEAUFORT SC MCAS	139758	1
94C0976	P00001	4/29/96	CON	UNFO INCORPORATE SKETCHES	BEAUFORT SC MCAS	10698	1
94C0984	P00005	9/30/93	AES	SCPE TRC MEETING	MINNEAPOLIS MN NIROP	5163	0.99
94C0984	P00006	3/17/94	AES	SCPE UPGRADE OF GROUNDWATER EX	MINNEAPOLIS MN NIROP	241602	0.99
94C0984	P00007	4/13/94	AES	SCPE EQUITABLE ADJUSTMENT FOR	MINNEAPOLIS MN NIROP	5334	0.99
94C0984	P00010	1/4/95	AES	SCPE UPGRADE GROUNDWATER EXTRA	MINNEAPOLIS MN NIROP	93271.26	0.99
94C0984	P00011	1/11/95	AES	SCPE ANNUAL MONTIORING REPORT	MINNEAPOLIS MN NIROP	83184.18	0.99
94C0984	P00013	4/3/96	AES	SCPE GW MONITORING REPORT NIRO	MINNEAPOLIS MN NIROP	31881.18	0.99
94C0995	P00001	10/21/94	MNT	ADMN LIFT PROMISE TO PAY	CHATTANOOGA TN NMCRC	16428	1
94C0995	P00003	1/10/96	MNT	ADMN LIFT PROMISE TO PAY	CHATTANOOGA TN NMCRC	16428	1
94C0995	P00004	3/11/96	MNT	CREQ CANCEL CONTRACT DUE TO RE	CHATTANOOGA TN NMCRC	-7563.5	1
94C1007		9/12/94	CON	ROOF REPL, OPS BLDG, TATTNALL	BEAUFORT SC MCAS	20863	1
94C1037		9/26/97	CON	REPAIR ROOF	SAN ANTONIO TX NMCRTC	218825	0.99
94C1039		3/19/97	CON	RPR/RPL A/C BLDG 8/RPR/RPL CHI	HOUSTON TX NMCRRC	230591	1
94C1039	P00001	6/30/97	CON	CREQ TEMPORARY A/C, REPLACE A/	HOUSTON TX NMCRRC	25171.47	1
94C1039	P00002	8/11/97	CON	UNFO RPR ELECTR CONDUIT, INSTA	HOUSTON TX NMCRRC	16359	1
94C1039	P00003	8/11/97	CON	UNFO REPLACE DUCTWORK B-8, HOU	HOUSTON TX NMCRRC	56358	1
94C1039	P00004	9/23/97	CON	UNFO REPLACE A/C BUILDING, NRR	HOUSTON TX NMCRRC	7671	1
94C1044		10/27/94	CON	ROOF REPAIRS, MCRC TERRE HAUTE	TERRE HAUTE IN NRC	85191	1

The lines with just the contract number (such as 93C1039) and no P0000 (pronounced "pooh") number represent the original contract and the award amount. The line with

a contract number and a P0000 number is a modification to the original contract and the amount is the change in contract price. P0000 numbers are assigned sequentially, and since the data does not include no-cost modifications, there may be P0000 numbers not listed. The four-letter code at the beginning of the modification description is the modification reason code.

To get the final data set to be analyzed:

- ✓ All contract types that were not "CON" (construction) were deleted and the Contract type column deleted
- ✓ All contracts which were not 100% complete were deleted and the fraction complete column deleted
- ✓ The P0000 number was separated and given it own column
- ✓ The date column was deleted
- ✓ Contracts that had incomplete data were deleted. For example, contract number 94C0984 in Table 2 only has modifications listed, but no parent contract
- ✓ Amounts were rounded to the nearest dollar

The resulting data consisted of 2202 contracts and 8366 modifications, a sample of which is shown below in Table 3.

Table 3: Sample Filtered Data

Contract #	P0000#	Description	Location	Amount
92C9729		PCB SPILL CLEANUP RUNWAY 13L O	CORPUS CHRISTI TX NAS	12861
92C9866	P00001	CRIT DELETE FIRE PROTECTION SY	STENNIS SPC CTR MS NRLDET	-7600
92C9866		CONSTRUCT 50 X 50' PRE-ENGINEE	STENNIS SPC CTR MS NRLDET	77648
92C9876	P00001	CRIT INSTALL URETHANE CAULKING	KEESLER AFB MS	6512
92C9876		REPAIR STANDING SEAM ROOF SYST	KEESLER AFB MS	94992
92CM433	P00004	SCPE REPLACE 24 HINGES	KINGS BAY GA NSB	827
92CM433	P00003	UNFO FABRIC FILTER FOR TRE	KINGS BAY GA NSB	1488
92CM433	P00002	UNFO SITE WORK ALTERATIONS	KINGS BAY GA NSB	3144
92CM433	P00001	SCPE MODERNIZE PLAYGROUND	KINGS BAY GA NSB	45950
92CM433		FH PLAYGROUNDS	KINGS BAY GA NSB	159843

4.2 Unadjusted Summary

Using a spreadsheet lookup table that had the modification reason codes separated into the previously defined categories, the dollar amounts and count of the different modification categories were tallied, subtotaled and summarized. Table 4 below shows the data sorted by category name. A more detailed explanation of each column follows the table.

Table 4: Unadjusted Summary Data

Category Name	Sum $	Sum #	Average $ for all contracts	Average $ per mod	Average # per contract	% of total contract $	% of # of mods
			(Sum $ / 2202)	(Sum $ / Sum #)	(Sum # / 2202)	(Sum $ / 1660635071	(Sum # / 8366)
ADMN	$ (6,364,021)	125	$ (2,890)	$ (50,912)	0.057	-0.38%	1.5%
Claim	1,971,049	55	895	35,837	0.025	0.12%	0.7%
COND	(58,274)	20	(26)	(2,914)	0.009	-0.00%	0.2%
CONV	(4,087,650)	6	(1,856)	(681,275)	0.003	-0.25%	0.1%
CREQ	29,063,576	1790	13,199	16,237	0.813	1.75%	21.4%
CRIT	3,093,898	228	1,405	13,570	0.104	0.19%	2.7%
DEFG	4,002,269	265	1,818	15,103	0.120	0.24%	3.2%
Design	32,060,242	2314	14,560	13,855	1.051	1.93%	27.7%
DFLT	(2,742,920)	11	(1,246)	(249,356)	0.005	-0.17%	0.1%
EROM	3,455,759	114	1,569	30,314	0.052	0.21%	1.4%
GMDL	1,434,739	45	652	31,883	0.020	0.09%	0.5%
LIQD	(1,850,950)	132	(841)	(14,022)	0.060	-0.11%	1.6%
Other	3,584,905	26	1,628	137,881	0.012	0.22%	0.3%
PLAN	107,026,072	68	48,604	1,573,913	0.031	6.44%	0.8%
RDSN	17,537	10	8	1,754	0.005	0.00%	0.1%
SCPE	12,103,923	162	5,497	74,716	0.074	0.73%	1.9%
STAT	146,874	8	67	18,359	0.004	0.01%	0.1%
TIME	195,122	25	89	7,805	0.011	0.01%	0.3%
UNFO	46,307,856	2926	21,030	15,826	1.329	2.79%	35.0%
VE	(520,348)	36	(236)	(14,454)	0.016	-0.03%	0.4%
TOTALS	**228,839,658**	**8366**	**103,924**	**974,118**	**3.799**	**13.78%**	**100.0%**
Total of all contract prices =	**1,660,635,071**	Total number of contracts =	**2202**				

- ✓ Sum $: The sum total dollar amount for modifications of that type
- ✓ Sum #: The sum total count of modifications of that type
- ✓ Average $ for all contracts: The average dollar amount of that modification type that each contract has

- ✓ Average $ per mod: The average dollar amount for each modification of that type
- ✓ Average # per contract: The average number of that modification type that each contract has
- ✓ % of total contract $: The sum total dollar amount for modifications of that type as a percentage of the total cost of all modifications
- ✓ % of # of mods: The sum total count of modifications of that type as percentage of the total number of modifications

As shown, the average contract has about 3.8 modifications, increasing the contract amount by an average of $103,924 or 13.78%. The most frequent modification is UNFO (35% of all modifications) and the largest dollar effect is due to PLAN modifications (a 6.4% increase in contract price.)

4.3 Summary Adjusted for "Planned" Modifications

Since I did not expect PLAN modifications to have the biggest dollar impact, they were examined closer. There were many large dollar amount modifications, both PLAN and ADMN, that dealt with increasing funding, incremental funding, and obligating money available. There was a single $99,796,604 modification for increasing funding for a 125 million-dollar contract. According to Larry Mellichamp, a Program Analyst at SOUTHDIV, these modifications are used for fiscal reasons to obligate money at different points in the life of the contract and are essentially part of the original bid amount. Since these modifications are expected, planned, and a part of the

original contract amount, they need to be accounted for in the data analysis so as not to skew the data.

By searching the description field by various keywords, all modifications that dealt with following were excluded:

- ✓ Funding: Incremental, adding, increasing, obligating, etc. These modifications are planned and necessary due to the fiscal nature of contract funding
- ✓ Additive Bids Items and Options: These are items which are bid, but only awarded at the option of the contracting officer
- ✓ Award Fees: Both additive and deductive based on the performance of the contractor
- ✓ Bid Errors: Corrections to the award amount

A total of 46 modifications totaling $114,212,644 met these criteria. (See Appendix B) They were removed from their reason code category and their total was added to the sum of all contracts, as if the amount was included in the award amount. For example, that $99,000,000 modification mentioned earlier was deleted and the contract amount increased from $125,000,000 to $224,000,00.

Recalculating the data yielded Table 5, on the next page, with the categories again in alphabetical order.

Table 5: Summary Data Adjusted for Planned Modifications

Category Name	Sum $	Sum #	Average $ for all contracts	Average $ per mod	Average # per contract	% of total contract $	% of # of mods
			(Sum $ / 2202)	(Sum $ / Sum #)	(Sum # / 2202)	(Sum $ / 1774877715	(Sum # / 8320)
ADMN	$ (11,663,874)	116	$ (5,297)	$ (100,551)	0.053	-0.66%	1.4%
Claim	1,971,049	55	895	35,837	0.025	0.11%	0.7%
COND	(58,274)	20	(26)	(2,914)	0.009	-0.00%	0.2%
CONV	(4,087,650)	6	(1,856)	(681,275)	0.003	-0.23%	0.1%
CREQ	28,755,431	1780	13,059	16,155	0.808	1.62%	21.4%
CRIT	3,095,898	227	1,406	13,638	0.103	0.17%	2.7%
DEFG	4,002,269	265	1,818	15,103	0.120	0.23%	3.2%
Design	32,060,242	2314	14,560	13,855	1.051	1.81%	27.8%
DFLT	(2,742,920)	11	(1,246)	(249,356)	0.005	-0.15%	0.1%
EROM	3,455,759	114	1,569	30,314	0.052	0.19%	1.4%
GMDL	1,434,739	45	652	31,883	0.020	0.08%	0.5%
LIQD	(1,850,950)	132	(841)	(14,022)	0.060	-0.10%	1.6%
Other	(26,348)	17	(12)	(1,550)	0.008	-0.00%	0.2%
PLAN	2,093,727	53	951	39,504	0.024	0.12%	0.6%
RDSN	17,537	10	8	1,754	0.005	0.00%	0.1%
SCPE	12,040,875	160	5,468	75,255	0.073	0.68%	1.9%
STAT	146,874	8	67	18,359	0.004	0.01%	0.1%
TIME	195,122	25	89	7,805	0.011	0.01%	0.3%
UNFO	46,307,856	2926	21,030	15,826	1.329	2.61%	35.2%
VE	(520,348)	36	(236)	(14,454)	0.016	-0.03%	0.4%
TOTALS	**114,627,014**	**8320**	**52,056**	**(748,833)**	**3.778**	**6.46%**	**100.0%**
Total of all contract prices =	1,774,877,715	Total number of contracts =	2202				

The largest effect was on the PLAN modifications in most part due to that single $99,796,604 modification. PLAN modifications went from 6.44% of total contract dollars to a mere 0.12%. The net dollar effect of all modifications fell from 13.78% to 6.46%.

4.4 Summary Adjusted for Terminations

In examining the summary in Table 5, the fact that the average amount per modification was a NEGATIVE $748,833, was totally unexpected. According to the table, the largest contributors to this negative amount are Terminations for Contractor Default (DFLT) and Terminations for Convenience of the Government (CONV).

Also, since I did not expected Administrative (ADMN) modifications to have such a large deductive effect, I began sorting the ADMN modifications by amount. I found

two ADMN modifications that alone totaled nearly 14 million dollars for terminations.

Since terminations and defaults happen to less than one percent of contracts, yet skew the category totals because of their large deductive modifications. Therefore, I felt that excluding terminated contracts would give a better picture of a "typical" contract.

I used several keyword searches to find all terminating modifications that weren't coded either Contractor Default (DFLT) or for Convenience of the Government (CONV).

The 20 terminated contracts, listed in Appendix C, and their 39 modifications were eliminated entirely from all calculations in the data previously adjusted for "planned" modifications, yielding the summary in Table 6.

Table 6: Summary Adjusted for Planned Modifications and Terminations

Category Name	Sum $	Sum #	Average $ for all contracts	Average $ per mod	Average # per contract	% of total contract $	% of # of mods
			(Sum $ / 2182)	(Sum $ / Sum #)	(Sum # / 2182)	(Sum $ / 1750918500	(Sum # / 8281)
ADMN	$ 2,319,976	111	$ 1,063	$ 20,901	0.051	0.13%	1.3%
Claim	1,971,049	55	903	35,837	0.025	0.11%	0.7%
COND	(58,274)	20	(27)	(2,914)	0.009	0.00%	0.2%
CONV	-	-	-	-	-	-	-
CREQ	28,774,264	1779	13,187	16,174	0.815	1.64%	21.5%
CRIT	3,095,898	227	1,419	13,638	0.104	0.18%	2.7%
DEFG	4,002,269	265	1,834	15,103	0.121	0.23%	3.2%
Design	31,903,935	2311	14,621	13,805	1.059	1.82%	27.9%
DFLT	-	-	-	-	-	-	-
EROM	3,455,759	114	1,584	30,314	0.052	0.20%	1.4%
GMDL	1,434,739	45	658	31,883	0.021	0.08%	0.5%
LIQD	(1,825,300)	130	(837)	(14,041)	0.060	-0.10%	1.6%
Other	(26,348)	17	(12)	(1,550)	0.008	0.00%	0.2%
PLAN	2,093,727	53	960	39,504	0.024	0.12%	0.6%
RDSN	17,537	10	8	1,754	0.005	0.00%	0.1%
SCPE	12,123,624	159	5,556	76,249	0.073	0.69%	1.9%
STAT	146,874	8	67	18,359	0.004	0.01%	0.1%
TIME	195,122	25	89	7,805	0.011	0.01%	0.3%
UNFO	46,320,766	2916	21,229	15,885	1.336	2.65%	35.2%
VE	(520,348)	36	(238)	(14,454)	0.016	-0.03%	0.4%
TOTALS	**135,425,269**	**8281**	**62,065**	**304,253**	**3.795**	**7.73%**	**100.0%**
Total of all contract prices =	1,750,888,500	Total number of contracts =	2182				

There were no terminated contracts that were effected by "planned" modifications.

A chart comparing the different summaries follows in Table 7.

Table 7: Summary Comparison

	Total of all contract prices	# of contracts	Sum $ of mods	Sum # of mods	Average $ for all contracts (Sum $ / # contracts)	Average $ per mod (Sum $ / Sum #)	Average # of mods per contract	% of total contract $
Unadjusted	$ 1,660,635,071	2202	$ 228,839,658	8366	$ 103,924	$ 974,118	3.799	13.78%
Adjusted for "planned" modifications	1,774,877,715	2202	114,627,014	8320	52,056	(748,833)	3.778	6.46%
Adjusted for "planned" modifications and terminated contracts deleted	1,750,888,500	2182	135,425,269	8281	62,065	304,253	3.795	7.73%

The data adjusted for both "planned" modifications and terminations is the best representation of the "contingency" effect of unexpected modifications on "typical" contracts.

Using the "% of total contract $" column from Table 6, the Pareto chart in Figure 1 on page 15 compares the relative cost effect of the various modification categories. The categories with the largest impact (6.11% of the total 7.73% for all modifications) are:

1) Unforeseen Conditions (2.65%)
2) Design Changes (1.82%)
3) Customer Requested Changes (1.64%)

A similar Pareto chart, Figure 2 on page 16, was created from the "% of # of modifications" of Table 6. The three largest categories from Figure 1 are also the most frequent:

1) Unforeseen Conditions (32.5%)
2) Design Changes (27.9%)
3) Customer Requested Changes (21.5%)

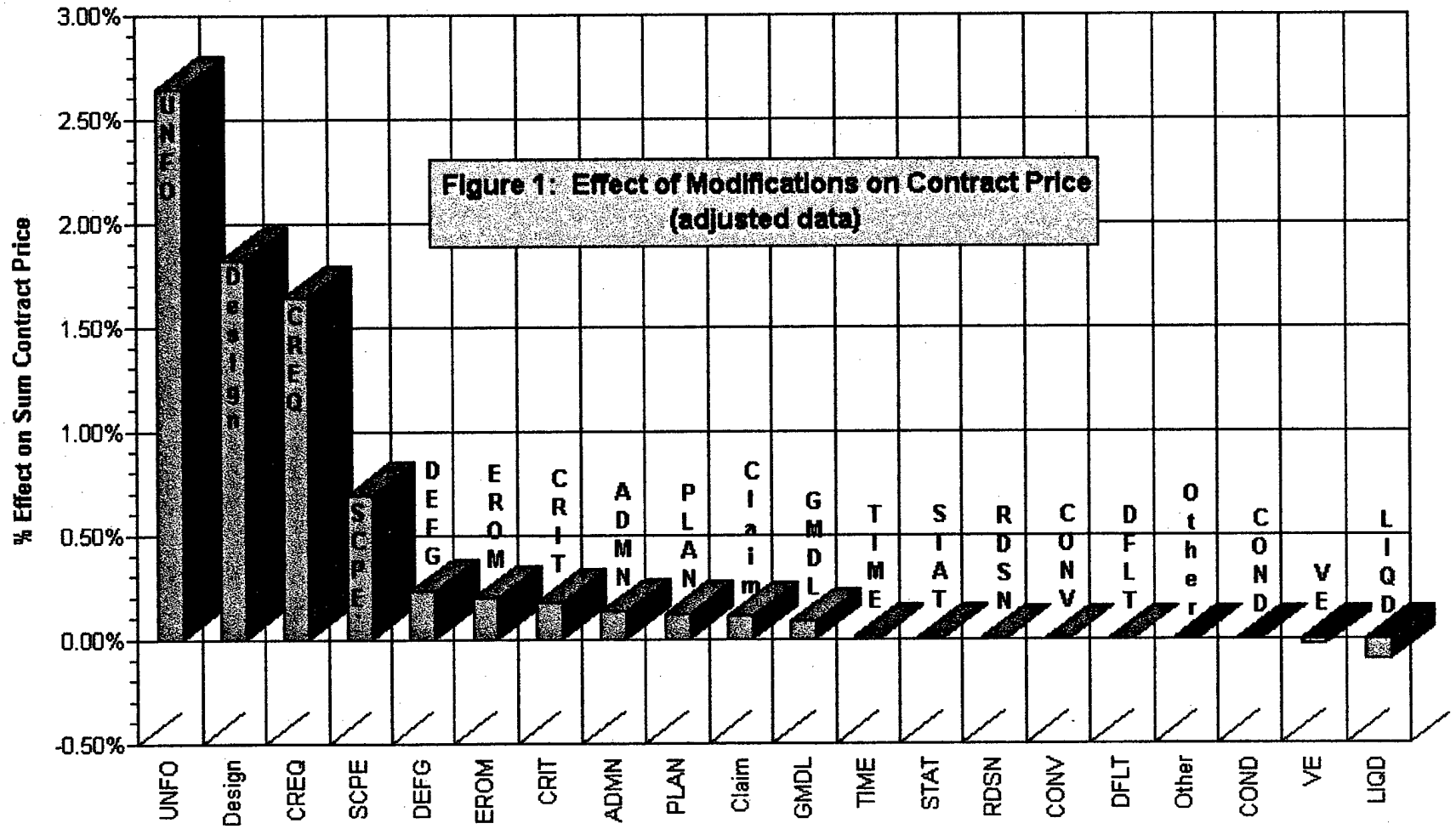
Figure 1: Effect of Modifications on Contract Price
(adjusted data)
% Effect on Sum Contract Price
3.00%
2.50%
2.00%
1.50%
1.00%
0.50%
0.00%
-0.50%
UNFO
Design
CREQ
SCPE
DEFG
EROM
CRIT
ADMN
PLAN
Claim
GMDL
TIME
STAT
RDSN
CONV
DFLT
Other
COND
VE
LIQD

Figure 2: Number of Mod Types as a Percentage of all Modifications
(adjusted data)
% of All Modifications
40%
35%
30%
25%
20%
15%
10%
5%
0%
UNFO
Design
CREQ
DEFG
CRIT
SCPE
LIQD
EROM
ADMN
Claim
PLAN
GMDL
VE
TIME
COND
Other
RDSN
STAT
CONV
DFLT

4.5 Statistical Analysis

In trying to find the standard deviation of the top three modification categories, I found that the modifications on a per contract basis do not have a normal distribution. Even when all contracts without a particular modification type were analyzed separately, the standard deviation was much greater than the mean, indicating a skew. See Table 8. No further statistical analysis was made.

Table 8: Statistical Analysis

	Design	CREQ	UNFO
Average Change in all contracts due to that type of mod (zeros included)	$ 14,628	$ 13,193	$ 21,238
Number of contract affected by that type of mod	735	729	1,060
Percentage of contracts affected by that type of mod	34%	33%	49%
Average Change in contract due to that type of Mod (zeros not included)	$ 43,407	$ 39,471	$ 43,698
Standard Deviation	$ 148,064	$ 136,984	$ 120,298
Average Contract price of contracts which have that type of mod	$ 1,766,200	$ 1,717,800	$ 1,386,183
Standard Deviation	$ 8,897,415	$ 8,975,466	$ 7,489,687
Single Largest Modification	$ 2,959,776	$ 2,287,322	$ 1,870,211

5. Barriers to Analysis

5.1 Reason Code Assignment Inconsistencies

The Project Manager or the Contract Specialist at the field office usually assigns the Modification Reason Code. There are many examples where the reason codes were used inconsistently in the data. The following are some samples:

- ✓ 2 cases of ADMN used to cancel a modification (CANC not used)
- ✓ 2 cases of ADMN used to for termination (Unknown if for contractor default {DFLT} or for convenience {CONV})
- ✓ 3 cases of UNFO used to cancel a modification (CANC)
- ✓ 2 cases of PLAN used for liquidated damages (LIQD)
- ✓ UNFO used for termination for convenience (CONV)
- ✓ UNFO used for liquidated damages (LIQD)
- ✓ TIME used for liquidated damages (LIQD)

Additive Bid Items were handled with a variety of modification reason codes: ADMN, CREQ, CRIT, PCAS, PLAN, and SCPE.

Also, several different reason codes were used for Award Fees: ADMN, CREQ, PCAS, and PLAN.

In addition, there were several cases of misspelled reason codes. These misspellings were corrected to the most likely intended codes:

- ✓ CREW changed to CREQ
- ✓ DSGM changed to DSGN
- ✓ LQID changed to LIQD
- ✓ CLMN changed to CLMR

The confusion in assigning reason codes is further complicated by differing definitions. In the old SOUTHDIV memo, Appendix A, an INIT reason code is defined as "Initial Award" while the FIS Training Manual defines it as "Initiate Continuation."

5.2 Two-Step Modifications

Typically in Navy contracting, a modification is executed "bilaterally." That is, prior to the actual start of changed work, both the Government and the contractor have agreed on the scope and price, and both have signed the modification.

If, for any reason, a bilateral agreement cannot be reached initially, the Navy can execute a "unilateral" modification directing the contractor to perform the work. Once a bilateral agreement has been reached, a second modification is executed which "definitizes" the unilateral. Because this situation requires two separate modifications, it is sometimes referred to as a "two-step" change.

In examining the FIS data, it became apparent that there are two ways used to assign modification reason codes to two-step modifications:

1) The first step, or unilateral modification, was given an appropriate code such as UNFO or CREQ. The second, or definitization mod, was given the DEFG code (Definitizing Modification). Used 265 times in the data.

2) The first step modification was given an appropriate code such as UNFO or CREQ. However, the second step was given the same code as the first step. Used about 460 times in the data.

The two different ways of handling two-step modifications can skew how modification types are counted and dollar amounts summed up. For example, assume a unilateral modification (first-step) is issued in the amount of $50,000 for an unforeseen condition. The Government and contractor later reach a bilaterally agreed total of $65,000, so a definitization modification (second-step) for $15,000 is issued. In the data analysis, the effect of the two different ways is:

1) First-step reason code: UNFO - $50,000
   Second-step reason code: DEFG - $15,000
   - Bottom line: 1 UNFO modification - $50,000
     1 DEFG modification - $15,000
   - Strength: Only 1 UNFO counted
   - Weakness: Only $50,000 is attributed to UNFO, not the total $65,000

2) First-step reason code: UNFO - $50,000
   Second-step reason code: UNFO - $15,000
   - Bottom line: 2 UNFO modifications - $65,000
   - Strength: All $60,000 is attributed to UNFO
   - Weakness: 2 UNFO counted, but only 1 changed condition

In my analysis, the data was left as originally entered into FIS because I was not able to consolidate the two ways

into a uniform method due to the large number of modifications and vague modification descriptions.

5.3 Examples of Vague Descriptions

The following is a sample of some of the more imprecise modification descriptions that I found, along with the reason code used:

CRIT:	Misc
UNFO:	Additional Labor
	Additional Work
	Various
	Unilateral
SCPE:	Task F
EROM:	PC-20 & PC-21
	Misc Changes
DSGN:	Added Work
ADMN:	Admin
	Termination

These types of descriptions would obviously make it difficult to analyze the data further, for example, to study what kind of unforeseen conditions cause the most UNFO changes.

5.4 Combining Different Changes

Based on my experience, it is not an uncommon practice to combine several different changes to the contract into a single modification. A problem arises when these different changes are of different modification types. These changes are sometimes combined into one modification using the reason code of the change with the largest dollar amount.

This practice makes sense because it reduces the paperwork at all levels of the modification process. It does, however, make a detailed analysis of the modification reason codes less accurate.

In this report, there is no accounting for this practice. The only way to know if a particular modification has multiple reason codes involved is to look at the original modification document. It is also possible to analyze the modification description, but dollar amounts attributable to the different reason codes would be indeterminate.

6. Conclusion

Based on the calculated 7.8% increase of contract price due to modifications, the customary practice of adding 10% to the budget estimate for contingencies is adequate for the typical Navy construction contract.

While in the Navy contracting business, I remember being told that a negotiated modification costs the Navy an extra 8% over the modification amount. This is from the loss of price competition and the extra administrative and overhead costs of funding and negotiations. Using this 8%, the extra cost of the three largest modification categories, Unforeseen Conditions, Design changes, and Customer Requested changes, is approximately 8.6 million dollars. I would recommend that the causes of these modifications be examined. Perhaps there is better value in investing more money in the site investigation phase of design. Money and, perhaps more important to the customer, time could be saved.

I also suggest that for the improvement of future data analysis, more information be entered into FIS. Possibly subsets of the "construction" contract type could be added, such as "new construction", "renovation" or "runway work." Better modification descriptions could also help with analysis. Further analysis could then be done to determine the statistical distribution of a particular modification type on a particular type of contract.

With money spent being usually more important than numerical statistical analysis, the more practical method of handling two-step changes is to assign the same reason codes to both steps. According to the data, it is also used twice as often the Definitizing Modification (DEFG)

reason code. Thus, my recommendation is to eliminate the DEFG reason code.

The problems I found in the use of modification reason codes involved relatively small amounts so their effect of the final results is minimal. However, the extra work involved in sorting through and searching for the misused reason codes would certainly be a roadblock to future and continued analysis of contract data. I would recommend clearer guidance for the assignment of modification reason codes.

Appendix A: SOUTHDIV Memo, "Design and Construction Contract Modification Reason Codes" dated Oct 1987

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P. O. BOX 10068
CHARLESTON, S. C. 29411-0068

PLEASE ADDRESS REPLY TO THE COMMANDING OFFICER, NOT TO THE SIGNER OF THIS LETTER. REFER TO:

Code 05
21 Oct 1987

From: Commanding Officer, Southern Division, Naval Facilities Engineering Command
To: Distribution

Subj: DESIGN AND CONSTRUCTION CONTRACT MODIFICATION REASON CODES

Ref: (a) NAVFACINST 4330.44B of 13 Mar 80

Encl: (1) Reason Codes

1. Although reference (a) has been cancelled, there still exists a need for contract modification reason codes. All contract and change order actions executed and administered within Southern Division and at the Station level will utilize the reason codes as outlined by enclosure (1). This data is required to support the Construction Management System (CMS).

M. F. CAMPBELL
By direction

Distribution:
SOUTHNAVFACENGCOM List 3 & 4
ROICCS/OICCS
Code 05 Area, Branch Managers
Code 09A

DESIGN & CONSTRUCTION CHANGE ORDER REASON CODES

As stated in paragraph 3.a.(4) of the instruction, the use of reason codes is not optional; however, the Field is not restricted to the codes listed herein. Internal codes may be used within the construction phase provided a list of these codes with respective definitions are forwarded to NAVFAC Headquarters Code 050. All such reason codes will be accumulated under the Group I category for goal reporting purposes.

A/E CONTRACTS/DESIGN PHASE

1. SITE — Resiting - The cost associated with changing the site or relocating the facility because the designated site is unsuitable due to unforeseen physical conditions, environmental planning requirements or non-technical constraints.

2. VALE — Value Engineering - The change order issued to accomplish value engineering studies.

3. VALD — Value Engineering Design - Cost of redesign to incorporate results of VE studies.

4. RDSN — Construction Cost Overrun - The cost to the government to reduce a project which exceeds available funds through no fault of the A/E. Situations like this arise when the authorization has been amended or the original government direction pertaining to scope of A/E contract was not correct.

5. IDSN — Interior Design - A change order for the sole purpose of providing interior design services.

6. OPTN — Option - Exercising option to meet next higher level of design completion; i.e., proceeding from 35 to 100%.

7. CREQ — Functional Planning - The cost associated with a design scope amendment to accommodate revised or new functional planning requirements of the facility, including revisions resulting from user (customer) requests, weapon systems modification, and changes to installed equipment not being acquired with construction project funds. (Customer Request)

8. CRIT — Non-functional Criteria - The cost associated with an in-scope amendment to accommodate revised or new building, utility or construction criteria, which does not relate to functional aspects of the project. Included in this category are design scope amendments related to building products, construction methods and techniques, structural criteria modifications related to unforeseen physical conditions of the site, revised energy conservation planning not resulting from statutory mandate, and revised or additional services not foreseen at the time of contract negotiation such as efforts to obtain data to confirm site conditions.

9. STAT — Statutory Regulations - The cost associated with design revision resulting from new or revised regulations which are imposed after the start of design and over which the Navy has no discretion in their implementation.

10. INIT — Initial Award - Change order to an annual contract to initiate a new design or to a testing services contract for added work.

11. SCPE — Scope - To add additional scope to the A/E contract. This does not cover scope which was not included due to omission by the government. (If omission is of in-scope functional nature use CREQ; if non-functional, CRIT). This reason code includes only new work.

12. SCON — Special Consultation - Change order to provide expert consultation of support for public hearings, claim cases, etc.

13. ADMN — Administrative - No cost, change to accounting or contract data.

A/E CONTRACTS/CONSTRUCTION PHASE

In addition to the above, the following apply to change orders which cite construction funds.

1. PCAS — Post Construction Award - Option or new initiative for as-builts and shop drawing review.

2. INSP Title II - Change order to procure Title II inspection services--if MCON/MILCON funds used, Headquarters approval required prior to negotiation and RFP.

3. OPMM Operations and Maintenance Manual - A change order to the design contract to prepare Operations and Maintenance manuals.

CONSTRUCTION AND OTHER CONTRACTS/CONSTRUCTION PHASE

Group I 1/

1. UNFO Unforeseen conditions.

2. SCPE Scope - To add additional scope to the contract. This does not cover scope which was not included due to omission by the government.

3. DSGN Design (design deficiency) - The use of design reason code for construction contract change orders is to be strictly limited to occurrences of one or both of the following:

(a) Design error - defined as a designer mistake--typical examples, 1) elevations wrong, 2) design required a six inch pipe versus four inch pipe.
(b) Design omission - occurs when an item is overlooked or not considered completely.

Note: In all cases where design is designated the responsibility of the designer must be questioned.

4. EROM Error or Omission - When AE liability is under investigation (Pending Change) or when AE paid all or a portion of the change order (Executed Change). If A/E is found not liable for compensation, use DSGN. If A/E is found liable but refuses to pay, use EROM with description field starting CLMP #XYZ.... A claim should then be instituted against the A/E. (Refer to Note 4.)

5. CREQ Customer Request - The cost associated with scope amendment to accommodate revised or new functional requirements of the facility.

6. CRIT Overall Criteria Change - The cost associated with an in-scope amendment to accommodate revised or new building, utility or construction criteria, which does not relate to functional aspects of the project.

7. VALE — Credit change order reflecting the savings resulting from redesign to incorporate the result of VE studies.

8. CLMP — Pending claim. 2/

9. CLMD — Claim is forwarded to NAVFAC for resolution. (Pending contract officer decision.)

10. CLMR — Final decision is rendered and the claim is upheld.

11. CLMA — Appeal of contracting officers decision - when contractor processes dispute past NAVFAC.

Group II 1/

12. TIME — Time delay.

13. ADMN — Administrative - No cost on a net basis; change to accounting or contract data.

14. CRCY — Currency revaluation.

15. PLAN — Planned - Such a change order refers to those changes that, prior to or at time of award, have been pre-planned to be handled as change orders due to the nature of the work involved (a simple example here would be modifications to requirements contract.); or to take advantage of an option beneficial to the government.

16. HQDR — Headquarters Directed - A special change order code whose use must be approved in advance by NAVFAC HQTR's by contracting NAVFAC (Code 050) by letter or message and providing proper justification. A special change order receiving NAVFAC HQTR's approval for legal, technical or functional reasons is not to be considered Headquarter's directed.

17. OPTN 3/ — Option - Maintenance Service contracts generally include option clauses which allow NAVFAC to extend the contract at the same price or at a fixed increased to the original price.

18. DFLT — Default - Used for defaulted contracts prior to award of a successor contract, and upon award to identify the successor contract.

19. LIQD - Assessment of LDs

20. RSUB - Assessment of Cost for Re-Reviewing Subm: Hold

Notes:

1. Change order reason codes for construction and other contracts in the construction phase are divided into two (2) groups. Group I change orders are those consummated changes that will count against the Field in determining their change order position throughout a fiscal year with regards to the construction Program's (Program IV) CMP change order goal. Group II change orders will not count against the Field's position in this goal. (Group II includes 12 through 16 above.)

2. a. Definition:

   Extract from the interim final rules of Procedure for Boards of Contract Appeals and Regulations; issued 26 February 1979 by the Office of Manpower and Budget, Office of Federal Procurement Policy

   "Claim" means:

   - o A written request submitted to the Contracting Officer;
   - o For payment of money, adjustment of contract terms, or other relief;
   - o Which is in dispute or remains unresolved after a reasonable time for its review and disposition by the Government, and;
   - o For which a Contracting Officer's decision is demanded.

   b. Should final decision result in a claim denial, all records should be deleted.

3. These change orders belong to neither Group I nor II and they relate only to Maintenance Service Contracts; i.e, contracts coded as "MNT". Such contract coding (MNT) prevents that contract and its change order activity from being monitored through existing automated change order reports; therefore, OPTN belongs to neither Group I nor II.

4. CMS description fields are to used to describe work pending or accomplished. With EROM description field should state known or estimated amount paid directly or indirectly by the design firm.

Appendix B: List of Planned Modifications Removed from Data

Cont #	Mod	Title	Location	Amt	
87C0097	P00002	ADMN CORR BID ERROR	JACKSONVILLE FL NAS	67,928	
94C0827	P00028	ADMN INCR CONTRACT PRICE	PENSACOLA FL NAS	2,340,396	
94C0830	P00004	ADMN INCREMENTAL FUNDING	PENSACOLA FL NAS	3,416,000	
92C0830	P00051	ADMN ADD AWARD FEE TO TOTAL CO	GREAT LAKES IL NTC	(27,600)	
89C0025	P00001	ADMN BID ITEM ERROR	KEESLER AFB MS	50	
90C0046	P00025	ADMN DELETE AWARD FEE PERIOD 1	CHARLESTON SC SWFLANT DET	(204,705)	
90C0046	P00031	ADMN DET AWD FEE	CHARLESTON SC SWFLANT DET	(75,093)	
90C0046	P00023	ADMN UNEARNED AWD FEE	CHARLESTON SC SWFLANT DET	(193,593)	
95C5649	P00001	ADMN UNIT PRICED BID ITEMS NOT	MERIDIAN MS NAS	(23,530)	
			TOTAL ADMN	5,299,853	9
95C0684	P00011	CREQ DELETE BID OPTION 2 WORK	CHARLESTON SC NWS	(433,070)	
95C0663	P00002	CREQ EXERCISE BID OPTION 1	CHARLESTON SC AFI	124,520	
94C5034	P00003	CREQ ADD BID ITEMS 2 AND 3	PARRIS ISLAND SC MCRD	99,500	
96C0704	P00004	CREQ ADDITIVE BID ITEM	NEW ORLEANS LA NAS	53,741	
94C0638	P00011	CREQ ADJUSTUSTMENT OF AWARD FE	GREAT LAKES IL NTC	(69,675)	
96C7090	P00004	CREQ AWARD BID ITEM #2.	NEW ORLEANS LA NSA	458,000	
94C0879	P00003	CREQ AWARD LINE ITEM 0002 - PA	ST LOUIS MO NRC	16,773	
94C3237	P00003	CREQ DELETE BID ITEM 4, MODULA	ATLANTA GA NAS	450	
90C0006	P00016	CREQ DELETE BID ITEM 5, REPLAC	BEAUFORT SC MCAS	30,906	
95C5039	P00001	CREQ INCORORATE ADDITIVE BID I	PARRIS ISLAND SC MCRD	27,000	
			TOTAL CREQ	308,145	10
92C0842	P00003	CRIT DELETE BID ITEM 1B(REMOVE	KEY WEST FL NAS	(2,000)	
			TOTAL CRIT	(2,000)	1
90C0562	P00002	OPTN ADD FUNDS	CHARLESTON SC NAVHOSP	23,768	
90C0562	P00024	OPTN EXCERCISE IST UNILATERAL	CHARLESTON SC NAVHOSP	2,666	
94C0892	P00001	OPTN EXERCISE OPTION LINE ITEM	GREAT LAKES IL NTC	2,313,000	
90C0562	P00011	OPTN EXTEND SERVICES 12 MONTHS	CHARLESTON SC NAVHOSP	26,120	
91C0416	P00006	OPTN GOVT EXERCISES OPTION PER	PENSACOLA FL PWC	24,539	
93C1097	P00006	OPTN OPTION FOR FURNITURE SYST	CHARLESTON SC	459,100	
96C0012	P00001	OPTP OPTION 2ND FLOOR BLDG 200	GREAT LAKES IL PWC	126,310	
95C0790	P00001	PCAS ADD BID OPTION 1	BARKSDALE AFB LA	135,750	
94C0827	P00013	PCAS AWARD FEE	PENSACOLA FL NAS	500,000	
			TOTAL PCAS	3,611,253	9
87C0034	P00001	PLAN EXERCISE OF OPTION ITEM,	PENSACOLA FL NAS	639,000	
94C0827	P00030	PLAN INCR FUNDING FOR P686T (C	PENSACOLA FL NAS	99,796,604	
94C0971	P00011	PLAN OBL FUNDING AVAILABLE FOR	GREAT LAKES IL NTC	54,000	
94C0971	P00012	PLAN OBL MONEY AVAILABLE FOR A	GREAT LAKES IL NTC	100,000	
94C0971	P00014	PLAN OBL MONEY AVAILABLE FOR A	GREAT LAKES IL NTC	200,000	
94C0971	P00015	PLAN OBLIGATE MONEY AVAILABLE	GREAT LAKES IL NTC	50,000	
94C0971	P00013	PLAN OBLIGATE MONEY AVAILABLE	GREAT LAKES IL NTC	175,000	
96C0758	P00003	PLAN OPTION TO ADD BID ITEMS 0	GREAT LAKES IL NTC	1,258,000	
88C0467	P00003	PLAN ADDITIVE BID ITEMS 2	CHARLESTON SC AFI	275,708	
94C0827	P00072	PLAN AWARD 70% OF AWARD FEE	PENSACOLA FL NAS	350,000	
94C0827	P00027	PLAN AWARD TO CONTRACTOR	PENSACOLA FL NAS	1,000,000	
88C0586	P00025	PLAN BONUS	MAYPORT FL NS	73,333	
94C0827	P00059	PLAN CONTRACTOR AWARDED 100% A	PENSACOLA FL NAS	1,000,000	
94C2923	P00002	PLAN DEDUCT FOR BID ITEMS 2 AN	PANAMA CITY FL NSWCCSTSYS	(4,950)	
94C0971	P00023	PLAN PC59 DEOB MONEY AWARD FEE	GREAT LAKES IL NTC	(34,350)	
			TOTAL PLAN	104,932,345	15
92CM485	P00004	SCPE BID ITEM 1 AND 2	KINGS BAY GA NSB	(13,578)	
88C0449	P00001	SCPE OPTION TO AWARD BID ITEM	CECIL FIELD FL NAS	76,626	
			TOTAL SCPE	63,048	2
			GRAND TOTAL	114,212,644	46

Appendix C: List of Terminated Contracts Removed from Data

Cont #	Title	Location	amt
Terminations for Default:			
91C0696	FIRE HOUSE ADDITION	NEW ORLEANS LA NAS	228900
92C2866	VENTIL B/1404	PENSACOLA FL PWC	24950
92C4902	REPLACE STEAM UNIT HEATERS 10	ALBANY GA MCLB	401351
92C4909	REPLACE 208 ROOFS, BOYETTE VIL	ALBANY GA MCLB	626811
92C9105	FIRE FIGHTING TRNG FAC	KINGSVILLE TX NAS	261885
94C0810	RPR BLDG. 27, NAS JAX	JACKSONVILLE FL NCOMTELST	700695
94C2692	REPAIR & REPLACE ROOF, PATRICK	ORLANDO FL NTC	248909
94C2982	SOFTBALL FIELD, PANAMA CITY, F	PANAMA CITY FL NSWCCSTSYS	238392
94C5225	REPL NX GAS TANKS NAS MEMPHIS	MEMPHIS TN NAVSUPPACT	284495
94C8021	REPAIR/ALTER NAVAL RESERVE CTR	FOREST PARK IL NRC	959318
95C2756	EXTERIOR PAINTING CAPEHARTS	KEY WEST FL NAS	468838
Terminations for Convenience:			
87C0629	LOGISTIC SUPPORT FAC	MEMPHIS TN NAVAIRES	1934542
88C0192	COAST GUARD HOUSING	KEY WEST FL NAS	12609487
88C0507	COLD STORAGE WAREHOUSE	ORLANDO FL NTC	1845000
93C1729	MODIFICATIONS TO LOX/LN2 FARM	GLENVIEW IL NAS	31428
93C9812	REMOVAL OF ASBESTOS, BLDG 39,	GLENVIEW IL NAS	81711
94C7842	REPLACE CEILING & LIGHTS @ E-2	INDIANAPOLIS IN NAWCACDIV	40500
95C7717	T150C - PROTECTIVE RAILINGS BL	KINGS BAY GA TRIREFITFAC	201805
97C0843	REPAIRS TO LAUREL BAY POTABLE	BEAUFORT SC MCAS	2300853
Unknown type of termination (ADMN mod description: "Termination")			
93C7667	REPAIR/WIDEN FIRST AND SECOND	CORPUS CHRISTI TX NAS	469345

References

Brassard, Michael and Diane Ritter, The Memory Jogger II, First Edition, 1994

FIS 2.0 Training Manual, 1995